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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/573,822

03/28/2006

Ryoji Hoshi

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EXAMINER

RAO, G NAGESH

ART UNIT

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1792

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/573,822	<b>Applicant(s)</b> HOSHI ET AL.	
	<b>Examiner</b> G. NAGESH RAO	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 October 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1) Claims 8-17 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US Pg Pub No. 2002/0017234) in view of Sakurada (US Pg Pub No. 2003/0116082).

With respect to claims 8-17 and 21-23, Ono '234 teaches the fabrication of single crystal silicon crystal ingots from raw material via the Czochralski (Cz) method, whereby it is taught that the single crystal product is produced having a substantially defect free region in the DZ (Denuded Zone) which is generally understood to be in existence outside the OSF region, whereby it is in a radial outwardly form given that the desired intention is to fabricate round single crystal wafers (See Abstract, Sections 0003-0004).

Furthermore Ono '234 teaches a series of cooling rate steps (each of which anticipate the claimed ranges for the temperature rate given the broadness of claimed invention) that fall within the range as prescribed by the claimed invention such as "...the single crystal is a silicon single crystal produced by the Czochralski method by selecting a cooling rate of not less than  $7.3^{\circ}\text{C}/\text{min}$  in the temperature range of  $1200\text{-}1050^{\circ}\text{C}$  (anticipating  $1150^{\circ}\text{C}$ - $1080^{\circ}\text{C}$  range) in the step of pulling up and a cooling rate of not more than  $3.5^{\circ}\text{C}/\text{min}$  in the temperature range of  $1000\text{-}700^{\circ}\text{C}$ . The method of manufacturing epitaxial wafers according to the present invention is characterized in that an epitaxial layer is grown on the surface of silicon wafers sliced from that single crystal.

The rapid cooling in the temperature range of 1200-1050<sup>0</sup>C. in the first stage of the cooling step to be controlled in pulling up the second single crystal produces the same effects as the cooling of the first single crystal. Further, the subsequent slow cooling in the temperature range of 1000-700.degree C (anticipating 1050-950<sup>0</sup>C range). in the next stage is based on the finding from the results shown in FIG. 1 that the oxide precipitate nuclei formed can be grown and rendered more thermally stable by such slow cooling.

Within the temperature range of 1000-700<sup>0</sup>C (anticipating the 950<sup>0</sup>C range)., a slow rate of cooling of not more than 3.5<sup>0</sup>C./min is employed, as mentioned above, since as indicated by the results of the pulling rate changing test mentioned above, such cooling rate produces sufficient effects of slow cooling to stably increase the density of oxide precipitates. (See Sections 0031-0033).

However Ono 234 fails to explicitly disclose an interstitial-type and vacancy-type defects non-existence via controlling the V/G value as indicated by a growth rate (V) and a temperature gradient (G) near a growth interface, nor the specified diameter growth and whether a magnetic field is employed.

In the same field of endeavor pertaining to single crystal growth of silicon ingots, Sakurada 082 discloses the controlling of V/G values with respect to the Cz

growth of the silicon ingot as a means of preventing defects from incurring in the single silicon crystal ingot (See Sections 0010-0015), as well utilizing an MCZ growth technique allowing for the diameter of the crystalline ingot to reach as much as 200mm in diameter (See Section 0059).

It would therefore be obvious to one having ordinary skill in the art at the time of the present invention to modify the teachings of Ono 234 with that of Sakurada 082, in order to achieve the benefits of defect-free growth in the Cz grown crystals, which as disclosed by Sakurada 082 allows for more optimal property characteristics of the grown crystalline material.

2) Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US Pg Pub No. 2002/0017234) in view of Sakurada (US Pg Pub No. 2003/0116082) in further view of Iino (US Patent No. 5,980,630).

From the aforementioned rejection, the hypothetical combination of Ono 234 and Sakurada 082 pertain to the fabrication of a single crystal silicon ingot material.

However the hypothetical combination fails to disclose the specified magnetic ranges for the magnetic field applied to the single crystal growth melt.

In the same field of endeavor pertaining to single crystalline growth utilizing an MCZ growth means, Iino 630 discloses the obvious advantageousness for employing a magnetic field in the growth of single crystalline ingot materials such as Silicon (See Abstract), it further discloses the known use of ranges from 3000-6000 gauss to be employed on the ingot growing melt as it is pulled from the melt (See Col 4 Lines 46-61).

It would be obvious to one having ordinary skill in the art at the time of the present invention to employ the specified technique of Iino 630 with that of the hypothetical combination of Ono 234 and Sakurada 082, in order to enhance the manufacturing process and aid in the suppression of defects from forming in the solidified ingot as it is pulled from the melt (See Col 2 Lines 50-68 and Col 3 Lines 1-7).

### ***Response to Arguments***

3) Applicant's arguments with respect to claims 8-23 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

4) Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.**

See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. NAGESH RAO whose telephone number is (571)272-2946. The examiner can normally be reached on 8:30AM-5PM (INDEPENDENT FLEX SCHEDULE).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MIKHAIL KORNAKOV can be reached on (571)272-



1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GNR  
/G. Nagesh Rao/

/Robert M Kunemund/

Primary Examiner, Art Unit 1792